

# ADVANCED DECISION SUPPORT SYSTEM (ADSS) FOR SPIRAL TECHNOLOGY INVESTMENTS

Dr. Leon D. Chapman<sup>1\*</sup>, Mark T. Elmore<sup>2</sup>, Dr. Rossitza A. Homan<sup>1</sup>,  
Jim D. Treadwell<sup>2</sup>, Dr. Kevin Boyack<sup>1</sup>, Phil Chamberlin<sup>3</sup>, Brian Minsk<sup>4</sup>

<sup>1</sup> Sandia National  
Laboratories  
Albuquerque, NM 87185

<sup>2</sup> Oak Ridge National  
Laboratory  
Oak Ridge, TN 37830

<sup>3</sup> Strategic Technologies,  
Inc.  
Albuquerque, NM 87110

<sup>4</sup> Search Technology,  
Inc.  
Norcross, GA 30071

## ABSTRACT

Decisions related to spiraling forward technologies to the warfighter are complex. There is a myriad of technologies and strategies, a large number of shareholders with related information, and capabilities are spread across U.S. Army, other DoD laboratories, other government and private Federally Funded Research and Development Centers (FFRDCs), and academia. The Advanced Decision Support System (ADSS) offers a mechanism for bringing together data that is distributed in location, diverse in content, and disparate in format. ADSS provides access to appropriate data, mechanisms for coalescing the data, tools for refining the data, and visualizations for human understanding of the data. ADSS provides effective means for gaining spiral technology investment insights and enhancing spiral technologies and R&D decision-making support.

## 1. INTRODUCTION

Planning for and investing in spiral technology research and development (R&D) for ultimate transition to the warfighter throughout the product life cycle is becoming increasingly complex. There is a need to evaluate the strategies and impacts of spiral technologies prior to selection for funding and potential integration into the Army's Unit of Action (UA) program (formerly called the Future Combat System). The numerous technology investments by government, academia, and industry often overlap. One goal of ADSS is to help maximize spiral technologies and research and development (R&D) investments into the UA program while minimizing duplication with appropriate insights to the rapidly increasing volume of technology and programmatic information.

A major goal of ADSS is to assist decision-makers by providing the right information to the right person at the right time. ADSS is a transformational system leveraging advances in textual processing of non-homogenous datasets, advanced information display, and

robust data mining using government off the shelf (GOTS), commercial off the shelf (COTS) and developmental software to enable robust information transfer to the system users. ADSS strives to improve program management through increased information visibility for spiral technology investments in the UA and enhance information acquisition and assimilation through advanced enabling technologies to include intelligent agents, data mining, 3D data visualization, and augmented cognition. See Figure 1.

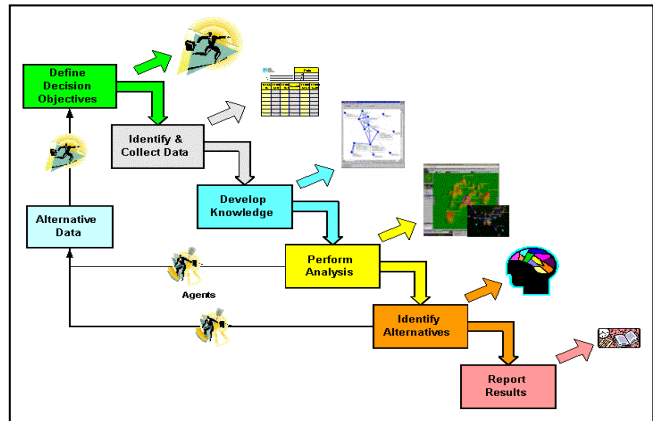


Figure 1: ADSS Process

## 2. BENEFITS

ADSS provides effective means for gaining spiral technology investment insights and enhancing spiral technologies and R&D decision-making support. ADSS provides enhanced progress and program management visibility and facilitates program management across a diverse portfolio of spiral technologies and R&D programs. ADSS is currently being developed under the Program Manager, Unit of Action, Technologies (PM UA-T) office and is being used to aid in accessing and understanding diverse data relevant to the UA acquisition process. ADSS will improve the spiral technologies and R&D process by providing relevant program information to PM UA-T, facilitating enhanced spiral technology

Report Documentation Page			Form Approved OMB No. 0704-0188		
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE <b>00 DEC 2004</b>		2. REPORT TYPE <b>N/A</b>		3. DATES COVERED <b>-</b>	
4. TITLE AND SUBTITLE <b>Advanced Decision Support System (Adss) For Spiral Technology Investments</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Sandia National Laboratories Albuquerque, NM 87185; Oak Ridge National Laboratory Oak Ridge, TN 37830; Strategic Technologies, Inc. Albuquerque, NM 87110; Search Technology, Inc. Norcross, GA 30071</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release, distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>See also ADM001736, Proceedings for the Army Science Conference (24th) Held on 29 November - 2 December 2005 in Orlando, Florida. , The original document contains color images.</b>					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>UU</b>	18. NUMBER OF PAGES <b>2</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

program investment portfolio strategies, and identifying spiral technology gaps and project overlaps. It will also provide visual navigation of technology views to aid management in road mapping progress toward specific goals and provide rapid updating of datasets from diverse partner sources using intelligent agents. ADSS is being developed as a tailored system to aid in making timely decisions with the right balance of information.

Integration of semantic text processing, tailored program interfaces and graphical display of textual data is in the early stages of development and poses a number of challenging issues. Current advances in augmented cognition will enable ADSS to minimize the cognitive gap between available data and human cognitive capacity. ADSS is concurrently developing architecture, to enable inclusion and integration of a family of data manipulation/analysis tools for use in managing large sets of projects potentially benefiting a number of agencies or companies. ADSS goals include enhanced human machine interface and reduced time and effort required to identify spiral technology gaps and duplication of efforts.

### 3. ARCHITECTURE

There are many good GOTS and COTS tools available on the market today that perform semantic processing and visualization. It has been the goal of the ADSS team to identify an initial set of tools that provide advanced capabilities with potential for flexible integration, which are free for government use.

The initial ADSS toolset is comprised of Oak Ridge National Laboratory's *Virtual Information Processing Agent Research (VIPAR)* system, the Sandia National

Laboratories' *VxInsight* system, and Search Technologies *TechOASIS* system. Each of those tools can deal with massive volumes of distributed data and knowledge that exists in a variety of formats to include Word documents, PowerPoint files, PDF files, Excel files, and text files. See Figure 2.

These documents are stored on a variety of platforms across a number of locations and organizations. ADSS was created to aid in the solution of access and understanding of all relevant data in a timely manner. The ADSS team is designing and implementing a flexible system architecture that integrates those tools along with intelligent agents for rapid data updating and conversion to meta-data for analysis. A primary ADSS goal is to provide an architecture that empowers the user by providing different cross sections of distributed datasets of interest.

For example, current ADSS tools are able to cluster data on a word, phrase, paragraph, and document level. In addition, varieties of advanced visualizations are available to aid analysts and decision makers. A demonstration version of ADSS has been completed using combined datasets that span the UA Operational Requirements Document (ORDs), the Army Science and Technology (S&T) Objectives (STOs), the TRADOC Force Operating Capabilities (FOCs), the DoDs S&T projects, and others. Current ADSS analysis allows insights into these diverse datasets that allows analysis to compare requirements (ORDs & FOCs) against technologies (STOs & S&Ts) in visualizations to help quantify gaps and overlaps of technology developments.

### 4. INTEROPERATION

ADSS is a system-of-systems, strongly parallel to the Future Force system-of-systems approach. To the current component systems, *VIPAR*, *VxInsight*, and *TechOASIS*, other desired analysis tools may be easily added to the ADSS toolbox. While each component system, in a short-sighted view, may be seen as a competitor to the others, the goal of ADSS is to remove the barriers and allow the systems to interoperate. ADSS moves the environment from one of competition to one of collaboration and complementation. This interoperation will bring a more powerful system to the ADSS user.

By enabling the interoperation of discreet systems, we believe that ADSS will be an important component of an extensible and expandable architecture for U.S. Army information.

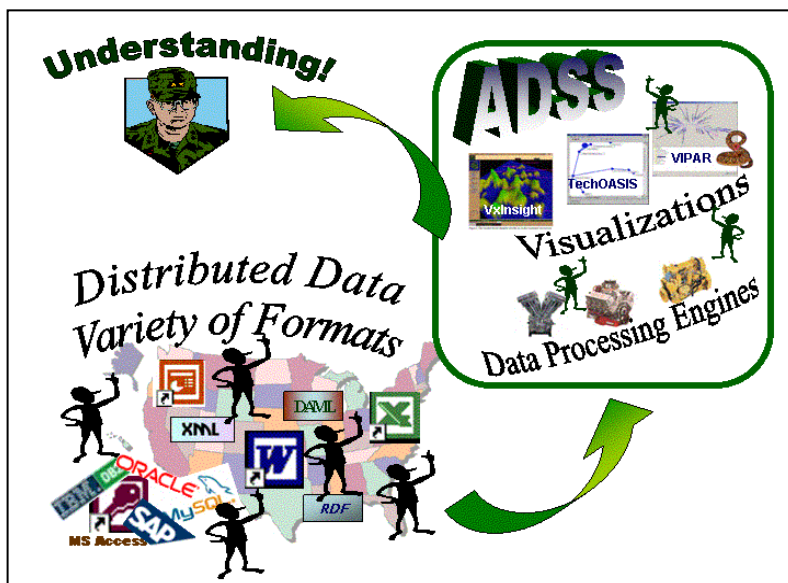


Figure 2: ADSS Architecture